IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Amulya MISHRA	Art Unit: 2121
Appl. No.:10/709,970	Examiner: KENNEDY, ADRIAN L
Filed: June 10, 2004	Atty. Docket: ORCL-005/OID-2004-338-01
For: Reducing number of computations in a Neural network modeling several data sets	

Amendment and Response Under 37 C.F.R. §§ 1.111

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Office Action mailed 01/11/2007, Applicants submit the following amendments and remarks.

Amendments to the claims are reflected in the listing of claims which begin on page 2 of this paper.

Remarks begin at page number 9 of this paper.

It is not believed that extensions of time or fees for net addition of claims are required, beyond those which may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, then such extensions of time are hereby petitioned under 37 C.F.R. § 1.136(a), and any fees required therefor (including fees for net addition of claims) are hereby authorized to be charged to Deposit Account No.: 20-0674.

Listing of Claims

Claim 1 (Currently Amended): A method of reducing number of computations when modeling several systems using a neural network, wherein said neural network contains a plurality of neurons, wherein each system is modeled by starting with a corresponding plurality of initial weights for said plurality of neurons and performing computations iteratively to compute weights of said neurons until said plurality of neurons with associated set of final weights causes said neural network to provide output values within a desired error level, said method comprising:

receiving a first data set characterizing the behavior of a first system, said first data set containing a first plurality of data elements;

modeling said first system based on said first data set using said neural network, wherein a first set of weights are generated by said modeling said first system, wherein said first set of weights corresponds to the set of final weights associated with said plurality of neurons modeling said first system;

receiving a second data set characterizing the behavior of a second system sought to be modeled by said neural network, said second data set containing a second plurality of data elements;

determining whether said first plurality of data elements follow a similar pattern as said second plurality of data elements; and

modeling said second system based on said second data set using said neural network, wherein said first set of weights are used as ~~initial~~ weights for said plurality of neurons while modeling said second system if said first plurality of data elements follow a similar pattern as said second plurality of data elements.

Claim 2 (Currently Amended): The method of claim 1, further comprising storing said first set of weights ~~and a second set of weights~~ in a non-volatile storage~~, wherein said second set of weights are generated by modeling said second system~~.

Claim 3 (Currently Amended): The method of claim 1, wherein random values are used as said plurality of initial weights for said plurality of neurons while modeling said

second system if said first plurality of data elements do not follow a similar pattern as said second plurality of data elements.

Claim 4 (Original): The method of claim 1, wherein said determining comprises:

fitting said first data set into a first curve, wherein said first curve is represented in the form of a first polynomial function having a first set of coefficients;

fitting said second data set into a second curve, wherein said second curve is represented in the form of a second polynomial function having a second set of coefficients;

computing a distance between said first set of coefficients and said second set of coefficients; and

checking whether said distance is less than a threshold, wherein said first plurality of data elements are determined to follow a similar pattern as said second plurality of data elements if said distance is less than said threshold.

Claim 5 (Original): The method of claim 4, wherein each of said first plurality of data elements and said second plurality of data elements is normalized to a pre-specified range prior to said fitting.

Claim 6 (Original): The method of claim 4, wherein each of said first set of coefficients and said second set of coefficients is normalized to a pre-specified range prior to said computing.

Claim 7 (Currently Amended): The method of claim 4, wherein each of said first data set and said second data set comprises stock share prices of ~~or~~ corresponding stocks.

Claim 8 (Currently Amended): A computer readable medium carrying one or more sequences of instructions causing a digital processing system reduce number of computations in a neural network modeling several data sets, wherein said neural network contains a plurality of neurons, wherein each system is modeled by starting with a corresponding plurality of initial weights for said plurality of neurons and performing computations iteratively computing weights of said neurons until said plurality of neurons with associated

set of final weights causes said neural network to provide output values within a desired error level, wherein execution of said one or more sequences of instructions by one or more processors contained in said digital processing system causes said one or more processors to perform the actions of:

receiving a first data set characterizing the behavior of a first system, said first data set containing a first plurality of data elements;

modeling said first system based on said first data set using said neural network, wherein a first set of weights are generated by said modeling said first system, wherein said first set of weights corresponds to the set of final weights associated with said plurality of neurons modeling said first system;

receiving a second data set characterizing the behavior of a second system sought to be modeled by said neural network, said second data set containing a second plurality of data elements;

determining whether said first plurality of data elements follow a similar pattern as said second plurality of data elements; and

modeling said second system based on said second data set using said neural network, wherein said first set of weights are used as ~~initial~~ weights for said plurality of neurons while modeling said second system if said first plurality of data elements follow a similar pattern as said second plurality of data elements.

Claim 9 (Currently Amended): The computer readable medium of claim 8, further comprising storing said first set of weights ~~and a second set of weights~~ in a non-volatile storage~~, wherein said second set of weights are generated by modeling said second system~~.

Claim 10 (Currently Amended): The computer readable medium of claim 8, wherein random values are used as said plurality of initial weights for said plurality of neurons while modeling said second system if said first plurality of data elements do not follow a similar pattern as said second plurality of data elements.

Claim 11 (Original): The computer readable medium of claim 8, wherein said determining comprises:

fitting said first data set into a first curve, wherein said first curve is represented in the form of a first polynomial function having a first set of coefficients;

fitting said second data set into a second curve, wherein said second curve is represented in the form of a second polynomial function having a second set of coefficients;

computing a distance between said first set of coefficients and said second set of coefficients; and

checking whether said distance is less than a threshold, wherein said first plurality of data elements are determined to follow a similar pattern as said second plurality of data elements if said distance is less than said threshold.

Claim 12 (Currently Amended): The computer readable medium of claim 11, wherein each of said first data set and said second data set comprises stock share prices of ~~or~~ corresponding stocks.

Claim 13 (Currently Amended): An apparatus in a digital processing system said apparatus reducing number of computations when modeling several systems using a neural network, wherein said neural network contains a plurality of neurons, wherein each system is modeled by starting with a corresponding plurality of initial weights for said plurality of neurons and performing computations iteratively computing weights of said neurons until said plurality of neurons with associated set of final weights causes said neural network to provide output values within a desired error level, said apparatus comprising:

means for receiving a first data set characterizing the behavior of a first system, said first data set containing a first plurality of data elements;

means for modeling said first system based on said first data set using said neural network, wherein a first set of weights are generated by said modeling said first system, wherein said first set of weights corresponds to the set of final weights associated with said plurality of neurons modeling said first system;

means for receiving a second data set characterizing the behavior of a second system sought to be modeled by said neural network, said second data set containing a second plurality of data elements;

means for determining whether said first plurality of data elements follow a similar pattern as said second plurality of data elements; and

means for modeling said second system based on said second data set using said neural network, wherein said first set of weights are used as ~~initial~~ weights for said plurality of neurons while modeling said second system if said first plurality of data elements follow a similar pattern as said second plurality of data elements.

Claim 14 (Currently Amended): The apparatus of claim 13, further comprising means for storing said first set of weights ~~and a second set of weights~~ in a non-volatile storage~~;~~ ~~wherein said second set of weights are generated by modeling said second system~~.

Claim 15 (Currently Amended): The apparatus of claim 13, wherein random values are used as said plurality of initial weights for said plurality of neurons while modeling said second system if said first plurality of data elements do not follow a similar pattern as said second plurality of data elements.

Claim 16 (Original): The apparatus of claim 13, wherein said means for determining is operable to:

fit said first data set into a first curve, wherein said first curve is represented in the form of a first polynomial function having a first set of coefficients;

fit said second data set into a second curve, wherein said second curve is represented in the form of a second polynomial function having a second set of coefficients;

compute a distance between said first set of coefficients and said second set of coefficients; and

check whether said distance is less than a threshold, wherein said first plurality of data elements are determined to follow a similar pattern as said second plurality of data elements if said distance is less than said threshold.

Claim 17 (New): A method of reducing number of computations when modeling several systems using a neural network, said method comprising:

receiving a first data set characterizing the behavior of a first system, said first data set containing a first plurality of data elements;

modeling said first system based on said first data set using said neural network, wherein a first set of weights are generated by said modeling said first system;

receiving a second data set characterizing the behavior of a second system, said second data set containing a second plurality of data elements;

determining whether said first plurality of data elements follow a similar pattern as said second plurality of data elements; and

modeling said second system based on said second data set using said neural network, wherein said first set of weights are used as initial weights while modeling said second system if said first plurality of data elements follow a similar pattern as said second plurality of data elements,

wherein random values are used as initial weights while modeling said second system if said first plurality of data elements do not follow a similar pattern as said second plurality of data elements.

Claim 18 (New): The method of claim 1, wherein said first set of weights are used as initial weights for said plurality of neurons in said neural network while modeling said second system.

Claim 19 (New): The computer readable medium of claim 8, wherein said first set of weights are used as initial weights for said plurality of neurons in said neural network while modeling said second system.

Claim 20 (New): The apparatus of claim 13, wherein said first set of weights are used as initial weights for said plurality of neurons in said neural network while modeling said second system.

REMARKS

Claims 1-16 were examined in the outstanding office action mailed on 01/11/2007 (hereafter "Outstanding Office Action"). All claims were rejected.

By virtue of this response, claims 1-3, 7, 8-10, 12, and 13-15 are sought to be amended, and claims 17-20 are sought to be newly added. The amendments and additions are believed not to introduce new subject matter, and their entry is respectfully requested. The amendments and additions are made without prejudice or disclaimer.

Claims 1-20 are thus respectfully presented for consideration further in view of the below remarks.

Objections to the Specification

The specification has been objected to under 37 CFR 1.75(d)(l) as not providing clear support for the phrase "computer readable medium".

Applicants first thank the Examiner for the detailed examination and the observation.

The Examiner has noted that Rule 1.75(d)(l) requires that the same words and phrases used in the claims be found in the specification.

It is respectfully noted that Rule 1.75(d)(1) requires "... ***clear support*** or ***antecedent basis*** in the description..." (***Emphasis Added***). Thus, Rule 1.75(d)(1) is believed to be supported if there is clear support or antecedent basis in the description.

The term "computer readable storage medium" provides clear antecedent basis as well as support for the claimed "computer readable medium" and thus the application as filed is believed to be in compliance with Rule 1.75(d)(1).

The Examiner had further noted that the claimed "computer readable medium" will be interpreted to include the word "storage" based on the presence of phrase "computer readable storage medium" of the application as filed.

Applicants disagree with such a construction.

The absence of "storage" in the claim would clearly communicate to one skilled in the relevant arts that "computer readable storage medium" is merely an instance of the claimed "computer readable medium".

A plain meaning of computer readable medium, at least in view of the absence of the term "storage", implies that the term would cover other mediums from which the instructions can be read by processors.

Withdrawal of the objection with respect to the specification is respectfully requested.

Claim Rejections - 35 U.S.C. § 101

Claims 1-16 were rejected under 35 U.S.C. § 101 as being directed to non-statutory subject matter. The Examiner appears to have applied the approach set forth in MPEP 2106 [R-5] in reaching such a conclusion.

Even assuming arguendo only for present purpose that the applicable parts of MPEP 2106 is sound law for present, Applicants respectfully traverse.

It is first noted that "the examiner bears the initial burden … of presenting a prima facie case of unpatentability." (In re Oetiker, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992)), as noted in Section "D. Establish on the Record a Prima Facie Case" of MPEP 2106.

The Examiner has not met such a burden for several reasons, some of which are explained below.

First, Applicants address the below portion of the rejection under 35 U.S.C. § 101:

> The examiner takes the position that "modeling" as claimed is ***merely a manipulation of data*** and as a result is not a patent eligible real world result. (Page 3, lines 8-11 of Outstanding Office Action, ***Emphasis Added***)

Applicants respectfully request the Examiner to show the specific basis (e.g., in case law, statutes or at least MPEP) for the proposition that all claims possibly based on mere manipulation of data constitute non-patentable subject matter.

Indeed the section entitled, "Annex IV. Computer Related Nonstatutory Subject Matter" of "Interim Guidelines for Examination of Patent Applications for Patent Subject Matter Eligibility" (hereafter "Interim Guidelines") notes several cases appearing to contradict such a broad proposition. See, for example, the reference to Court of Appeals for the Federal Circuit decisions in State Street Bank & Trust Co. v. Signature Financial Group Inc., 149 F. 3d 1368, 47 USPQ2d 1596 (Fed. Cir. 1998) and AT&T Corp. v. Excel Communications, Inc., 172 F.3d 1352, 50 USPQ2d 1447 (Fed. Cir. 1999) in page 39 of the Interim Guidelines.

Secondly, it is believed that the Examiner needs to establish that the claimed subject matter relates to at least one of "Abstract Ideas, Laws of Nature or Natural Phenomenon" before applying "Section IV.C.2.(B).(2) Practical Application That Produces a Useful, Concrete, and Tangible Result" (hereafter "Test of Interest") of MPEP 2106.

The Examiner has not met that threshold burden of showing that the claim relates to one of those three categories. For present purpose, it is assumed that the Examiner considers "Abstract Idea" prong to be relevant. It is unclear which part of the claim the Examiner considers as "Abstract Idea" for further analysis below.

Even under such an assumption, the applicable test for patentable subject matter laid by the Federal Circuit is 'Practical Application of an Abstract Idea' (see pages 36-39 of the Interim Guidelines). Numerous cases are noted there where an abstract idea applied to an "useful end" is eligible for a patent.

Furthermore, as noted in lines 10-15 of page 38 of the Interim Guidelines:

> In determining whether the claim is for a "practical application," the focus is not on whether the steps taken to achieve a particular result are useful, tangible and concrete, but ***rather that the final result is "useful, tangible and concrete."*** (***Emphasis Added***)

The Examiner appears to base the rejection merely on the 'tangible' criteria above.

The result of the claims is tangible because the result is in the context of modeling neural networks, a practical application. Accordingly, unlike in *Benson*, the claim is not abstract to the point of covering all applications of the Abstract Idea (the bounds of which have not been set by the Examiner in establishing a prima facie case), and thus satisfies the 'tangible' requirement.

Therefore, under the Applicable precedent and practice, all the presented claims are believed to constitute patentable subject matter.

Withdrawal of rejection under 35 U.S.C. § 101 is respectfully requested.

Claim Rejections - 35 U.S.C. § 102

Claims 1-6, 8-11, 13-16 were rejected under 35 U.S.C. 102(b) as being anticipated by US Patent Number 5,809,490 issued to Guiver *et al* (hereafter 'Guiver'). Applicants respectfully traverse with respect to at least some of the previously presented claims. In addition or in the alternative, the rejection is rendered moot in view of the foregoing amendments.

For example, newly added claim 17 corresponds to previously presented claim 3. While rejecting claim 3 in the Outstanding Office Action, it was stated that:

> The method wherein random values are used as initial weights (C 7, L 50-52; *"the initial weights of the SOM network may be chose using a number of strategies. Preferably, the initial weights are selected using a random number generator")* while modeling said second system if said first plurality of data elements do not follow a similar pattern as said second plurality of data elements (C 9, L 64-66; *"the Kohonen neuron with the smallest distance adjusts its weight to be closer to the values of the*

input data. The neighbors of the winning neuron also adjust their weights to be closer to the same input data vector"; The examiner takes the position that **the initial winning neuron weight is used in the following training process regardless of whether the inputs (first data elements) follow a similar pattern of the outputs (second data elements)**. This position is based on the fact that Guiver et al. teaches in Column 10, Lines 4-11 that the correct output doesn't have to be known in order to determine a winning weight).
(Page 7, lines 5-16 of the Outstanding Office Action, **Emphasis Added**)

Applicants respectfully traverse.

New claim 17 recites in relevant parts:

A method of reducing number of computations when modeling several systems using a neural network, said method comprising:

receiving a first data set characterizing the behavior of a first system, said first data set containing a first plurality of data elements;

modeling said first system based on said first data set using said neural network, wherein a first set of weights are generated by said modeling said first system;

receiving a second data set characterizing the behavior of a second system, said second data set containing a second plurality of data elements;

determining ***whether said first plurality of data elements follow a similar pattern as said second plurality of data elements***; and

modeling said second system based on said second data set using said neural network, wherein said ***first set of weights are used as initial weights while modeling said second system if said first plurality of data elements follow a similar pattern as said second plurality of data elements,***

wherein ***random values are used as initial weights while modeling said second system if said first plurality of data elements do not follow a similar pattern as said second plurality of data elements***.
(New claim 17, ***Emphasis Added***)

Thus, a first set of weights are used as initial weights if the first plurality of data elements follow a similar pattern as the second plurality of data elements, and random values are used if the first plurality of data elements do not follow a similar pattern as the second plurality of data elements.

While Guiver teaches the use of random numbers as initial weights in the below text, there is no disclosure or suggestion in the art of record that such usage is as claimed in new claim 17:

> Prior to using the Kohonen SOM clusterizer, the SOM needs to be trained. FIG. 6 shows the routine to train the Kohonen SOM of FIG. 5 in more detail. In FIG. 6, the input data x is loaded in step 182. Next, the weights of the SOM network is initialized in step 184. ***The initial weights of the SOM network may be chosen using a number of strategies. Preferably, the initial weights are selected using a random number generator.***
> (Col. 7, lines 46-54 of Guiver, ***Emphasis Added***)

It is further asserted that the Examiner incorrectly equates the if condition noted above with "the initial winning neuron weight is used in the following training process ***regardless*** of whether the inputs (first data elements) follow a similar pattern of the outputs (second data elements)" (***Emphasis Added***, page 7 lines 12-16 of the Outstanding Office Action).

In particular, one skilled in the relevant arts would understand that "regardless" implies that no condition is checked. In sharp contrast, claim 17 checks for a specific condition, as noted above.

Accordingly, the usage of the random weights is not according to the claimed condition, as also evident from the above explanation with the specific portion of Guiver.

Thus, new claim 17 is allowable over the art of record.

The rejection with respect to claim 1 is believed to be rendered moot in view of the foregoing amendments. For example, amended claim 1 recites:

> A method of reducing number of computations when modeling several systems using a neural network, wherein said neural network contains a plurality of neurons, wherein each system is modeled by starting with a corresponding plurality of initial weights for said plurality of neurons and ***performing computations iteratively to compute*** weights of said neurons until said plurality of neurons with associated ***set of final weights causes said neural network to provide output values within a desired error level***, said method comprising:
> receiving a first data set characterizing the behavior of a first system, said first data set containing a first plurality of data elements;
> modeling said first system based on said first data set using said neural network, wherein a first set of weights are generated by said modeling said first system, ***wherein said first set of weights corresponds to the set of final weights associated with said plurality of neurons modeling said first system***;

receiving a second data set characterizing the behavior of a second system sought to be modeled by said neural network, said second data set containing a second plurality of data elements;

determining whether said first plurality of data elements follow a similar pattern as said second plurality of data elements; and

modeling said second system based on said second data set using said neural network, ***wherein said first set of weights are used as weights for said plurality of neurons*** while modeling said second system if said first plurality of data elements follow a similar pattern as said second plurality of data elements.

(Currently Amended Claim 1, ***Emphasis Added***)

Amended claim 1 thus recites that the modeling entails performing computations iteratively to compute set of final weights which causes the neural network to provide output values within a desired error level.

The final weights modeled for the first system are used as weights in modeling the second system if the first plurality of data elements and the second plurality of data elements follow a similar pattern. New claim 18 recites the first weights modeled are used as initial weights in modeling the second system.

In sharp contrast, the Examiner is believed to have equated the first set of weights to non-final weights in the Outstanding Office Action.

Accordingly, amended claim 1 is believed to be allowable over Guiver. Withdrawal of the rejection under 35 U.S.C. § 102 is respectfully requested.

Dependent claims 2-7 and 18 are allowable at least as depending from allowable base claim 1.

New dependent claim 18 is independent allowable in reciting that the first set of weights are used as initial weights while modeling the second system.

Amended independent claim 8 is also allowable at least for some of the reasons given above in reciting:

A computer readable medium carrying one or more sequences of instructions causing a digital processing system reduce number of computations in a neural network modeling several data sets, wherein said neural network contains a plurality of neurons, wherein each system is modeled by starting with a corresponding plurality of initial weights for said plurality of neurons and ***performing computations iteratively computing*** weights of said neurons until said plurality of neurons with associated ***set of final weights causes said neural network to provide output values within a desired error level***, wherein execution of said one or more sequences of instructions by one or more processors contained in said digital processing system causes said one or more processors to perform the actions of:

receiving a first data set characterizing the behavior of a first system, said first data set containing a first plurality of data elements;

modeling said first system based on said first data set using said neural network, wherein a first set of weights are generated by said modeling said first system, ***wherein said first set of weights corresponds to the set of final weights associated with said plurality of neurons modeling said first system***;

receiving a second data set characterizing the behavior of a second system sought to be modeled by said neural network, said second data set containing a second plurality of data elements;

determining whether said first plurality of data elements follow a similar pattern as said second plurality of data elements; and

modeling said second system based on said second data set using said neural network, ***wherein said first set of weights are used as weights for said plurality of neurons*** while modeling said second system if said first plurality of data elements follow a similar pattern as said second plurality of data elements.
(Currently Amended Claim 8, ***Emphasis Added***)

Dependent claims 9-12 and 19 are allowable at least as depending from allowable base claim 8.

Amended independent claim 13 is also allowable at least for some of the reasons given above in reciting:

An apparatus in a digital processing system said apparatus reducing number of computations when modeling several systems using a neural network, wherein said neural network contains a plurality of neurons, wherein each system is modeled by starting with a corresponding plurality of initial weights for said plurality of neurons and ***performing computations iteratively computing*** weights of said neurons until said plurality of neurons with associated ***set of final weights causes said neural network to provide output values within a desired error level***, said apparatus comprising:

means for receiving a first data set characterizing the behavior of a first system, said first data set containing a first plurality of data elements;

means for modeling said first system based on said first data set using said neural network, wherein a first set of weights are generated by said modeling said first system, ***wherein said first set of weights corresponds to the set of final weights associated with said plurality of neurons modeling said first system***;

means for receiving a second data set characterizing the behavior of a second system sought to be modeled by said neural network, said second data set containing a second plurality of data elements;

means for determining whether said first plurality of data elements follow a similar pattern as said second plurality of data elements; and

means for modeling said second system based on said second data set using said neural network, ***wherein said first set of weights are used as weights for said plurality of neurons*** while modeling said second system if said first plurality of data elements follow a similar pattern as said second plurality of data elements.

(Currently Amended Claim 13, ***Emphasis Added***)

Dependent claims 14-16 and 20 are allowable at least as depending from allowable base claim 13.

Claim Rejections - 35 U.S.C. § 103

Claims 7 and 12 were rejected under 35 U.S.C. 103(a) as being unpatentable over Guiver in view of US Patent Number 2004/0093315 issued to Carney *et al*. The rejections are rendered moot as the base claim are allowable over the art of record as noted above.

Conclusion

Thus, all the objections and rejections are believed to be overcome and the application is believed to be in condition for allowance. The Examiner is invited to telephone the undersigned representative at 707.356.4172 if it is believed that an interview might be useful for any reason.

Respectfully submitted,

/Narendra R Thappeta/
Signature

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